ONCOLOGY REPORTS 5: 1221-1223, 1998

Relation of exposure to environmental tobacco smoke and pulmonary adenocarcinoma in non-smoking women: A case control study in Nanjing

ETS
epi study

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Received June 8, 1998; Accepted July 7, 1998

Abstract. To examine the relationship between exposure to passive smoke (herein referred to as environmental tobacco smoke, ETS), cooking fumes, other risk factors and primary adenocarcinoma of the lung, 70 adenocarcinoma lung cancer cases of non-smoking women in Nanjing were studied in a 1:1 case-control study. Results show no statistical association between exposure to ETS and pulmonary adenocarcinoma. The respective odds ratios for chronic lung disease, cooking fume pollution and family tumor history were 3.90, 2.45 and 4.36.

Introduction

Ever since Hirayama (1) and Trichopoulos and co-workers (2) first reported on the relationship between exposure to ETS and lung cancer in 1981, many studies on the subject have appeared in various parts of the world with very different conclusions. Some have concluded that exposure to ETS is related to lung cancer (3-5), while others have found no association between the two (6,7). Some investigators suggest that exposure to ETS is associated with some, rather than all, histologic types of lung cancer (8). To examine the relationship between exposure to ETS and female lung adenocarcinoma, a case-control study with 70 cases of primary lung carcinoma in never-smoking females was performed in Nanjing.

Materials and methods

Case selection. In 1993, 70 cases of female non-smokers with primary lung cancer were identified (by International Classification of Disease Code 163) in Nanjing. The cases were required to have lived in Nanjing for at least 20 years.

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Key words: tobacco smoke, pulmonary adenocarcinoma

Control selection. Healthy controls were randomly selected from the same neighborhoods and were matched 1:1 by sex, age (±5 years) and occupation.

Data collection. A standardized questionnaire was administered by trained medical staff to collect data on exposure to ETS, as well as other parameters from controls and cases. The data covered a period of 20 years, dating back from the day when lung adenocarcinoma was diagnosed.

Data analyses. The Mantel-Haenszel method was used to analyze the relationship between exposure to ETS and pulmonary adenocarcinoma (9). The relationship between ETS exposure levels and years of exposure and lung cancer was also analyzed. Single-factor and multi-variate analyses of the coded data (Table I) were performed by conditional logistic regression.

Results

Analysis of the relationship between exposure to ETS and the occurrence of primary lung adenocarcinoma in non-smoking women. Table II is a comparison of ETS exposure in both cases and controls. $X^2_{MH} = 1.19$, $P>0.05$. Table III is a comparison of daily exposure to ETS. According to Mantel-Haenszel test of unifotmity $X^2_{MH} = 0.77$, $P>0.05$. Table IV is a comparison of the effects of years of ETS exposure in cases and controls. $X^2_{MH} = 1.00$, $P>0.05$. The results of all three comparisons show that there was no statistically significant association between exposure to ETS and pulmonary adenocarcinoma in this group of non-smoking women in Nanjing.

Conditional logistic regression analyses. Table V is a conditional logistic regression single-factor analysis, which shows that exposure to ETS was not statistically significantly associated with lung adenocarcinoma. Among the 8 variables, chronic lung disease, cooking fume pollution and family tumor history show statistically significant association with lung adenocarcinoma. These three variables were then subjected to multivariate analysis. These results

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Table I. Variables and coding system for conditional logistic regression analysis.

Variables	Codes
X1 Exposure to ETS	ΣNCY/20 N: number of family smoker C: cigarettes smoked per day for every smoker Y: smoking years for every smoker
X2 Chronic lung diseases (Chronic bronchitis and pulmonary tuberculosis)	0: none; 1: yes
X3 Living quarters condition	Average areas per person (m^2)
X4 Type of fuel in the home	0: gaseous fuel; 1: yes
X5 Coal stove for heating	0: none; 1: yes
X6 Cooking fume/pollution	0: none; 1: yes
X7 Participation in cooking	Number of times per week
X8 Family history of cancer	0: none; 1: yes

Table II. Exposure to ETS and non-smoking female lung adenocarcinoma.

		Cases		
		Yes	No	Total
Controls	Yes	43	8	51
	No	13	6	19
Total		56	14	70

X^2_{MH} = 1.19; P>0.05; OR=1.625, 95% CI 0.679-3.888.

Table III. Exposure to ETS and non-smoking female lung adenocarcinoma.

ETS exposure (cigarettes per day)	Cases	Controls	OR	95% CI
0	14	11	1.0	
5	10	12	0.65	0.19-2.12
10	12	9	1.05	0.40-2.73
>20	34	38	0.70	0.27-1.76

X^2_{MH} = 0.77; P>0.05.

Table IV. Years of exposure to ETS and non-smoking fe lung adenocarcinoma.

Years of ETS exposure	Cases	Controls	OR	95% CI
0	14	11	1.0	
10	19	24	0.62	0.22-1.69
>20	37	35	0.83	0.53-1.29

X^2_{MH} = 1.00; P>0.05.

Table V. Results of single-factor analysis by conditional logistic regression.

Variables	Regression coefficient (β)	Standard error of regression $S_{c(\beta)}$	Odds ratio (OR)	95% CI of OR	p-value
X1	0.3184	0.4646	1.38	0.55-3.42	0.2466
X2	1.8718	0.7594	6.50	1.47-28.80	0.0069
X3	0.0226	0.0305	1.02	0.96-1.09	0.2297
X4	0.4094	0.5888	1.51	0.47-4.78	0.2435
X5	0.5735	0.4166	1.78	0.79-4.02	0.0837
X6	1.2528	0.4009	3.50	1.60-7.68	0.0009
X7	0.0660	0.1041	1.07	0.87-1.31	0.2630
X8	1.8819	0.7602	6.57	1.48-29.13	0.0059

Table VI. Multi-variate analysis by conditional logistic regression.

Variables	Regression coefficient (β)	Standard error of regression $S_{c(\beta)}$	Odds ratio (OR)	95% CI of OR	p-value
X2	1.5245	0.7740	3.90	1.00-20.94	0.4785
X6	0.8941	0.4286	2.45	1.06-5.66	0.0185
X8	1.6012	0.8014	4.36	1.03-23.85	0.0354

are presented in Table VI. They show that the occurrence of lung adenocarcinoma in female non-smokers in Nanjing was related to chronic lung disease, kitchen cooking fume pollution and family history of tumor, with respective odds ratios of 3.90, 2.45 and 4.36.

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Discussion

The biological effects of exposure to ETS are complex; a major problem being how its effects can be accurately assessed. The effect of ETS exposure is not only related to the number of smokers and how much they smoke, but also to smoking habits, type of tobacco used and ventilation of living quarters. This survey was conducted by two groups of data takers at different times. The response rate was 100%, thereby assuring the accuracy and reliability of the data.

The association of exposure to ETS and lung adenocarcinoma has been reported by some in the literature (5,10). Our study, however, did not find an association. Whether by simple yes or no answer to exposure, or by the extent of daily exposure or years of exposure, no relationship was found between the two. Thus, the relation of exposure to ETS and lung adenocarcinoma, if any, is not supported by this study.

By multivariate analysis, the occurrence of pulmonary adenocarcinoma in non-smoking women of Nanjing was found to be associated with chronic lung disease, kitchen cooking fume pollution and family tumor history. It is known that Chinese women have low smoking rates yet high lung cancer rates, especially lung adenocarcinoma. Because of the custom of cooking with high heat in China, cooking fume is often an indoor pollutant. Results of this investigation suggest that greater attention must be given to pollution due to cooking fumes as a risk factor for lung adenocarcinoma in non-smoking females.

Acknowledgments

Bao-Sen Zhou is the recipient of a fellowship award from the Center for Indoor Air Research. The authors wish to thank Dr Joseph M. Wu for editorial assistance in the preparation of this manuscript.

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